Prof. Errera also read a paper on the struggle for pre-eminence and inhibitory stimuli in plants, and Dr. J. P. Lotsy (Leyden) gave an account of his discovery of a new alkaloid in *Strychnos nux-vomica*.

Important papers were also read by Prof. R. Chodat (Geneva), on oxidising enzymes and katalases in plants; by Prof. G. Klebs (Halle), on the artificial formation of a new race; by Prof. F. Czapek (Prague), on the importance of the anti-ferment test in geotropically stimulated roots; by Prof. K. Fujii (Tokio), on the pollination of Gymnosperms; and by Dr. G. J. Peirce (California), on the dissemination and germination of *Arceuthobium occidentale*.

Mr. J. Parkin gave an experimental demonstration of a brilliant pigment appearing after injury in species of Jacobinia, the shoots of which when bruised and extracted with water yield a beautiful purplish liquid. Such a reducing agent as stannous chloride decolorises it. Micro-organisms can also readily bleach it when oxygen is excluded, but on allowing air to enter the original colour at once returns. The whole phenomenon bears some resemblance to the way in which indigo arises in plant-tissues.

Papers were also contributed by Dr. Otto V. Darbishire on the transpiration stream in small plants, and by Dr. George Barger on saponarine (soluble starch).

Fungi.

Prof. H. Marshall Ward, F.R.S., gave an address on recent researches in parasitic fungi. The investigations of De Bary and others were shortly described, and then Prof. Ward described his own experimental work on the determination of the external conditions necessary for the germination of the spores of fungi. He showed that a knowledge of the germinating capacity of the spores is necessary in order to arrive at definite conclusions as to the immunity of new varieties of cereals from disease. In opposition to Prof. Eriksson, he maintained that there is no evidence to show that fungus diseases are spread in any other way than by spores, and that his experimental and microscopic investigations do not in any way support Eriksson's mycoplasm theory.

Prof. Eriksson (Stockholm), in a paper on the vegetative life of some Uredineæ, dealt in considerable detail with this question, and sought to show that the evidence before us as to the infection of cereals by the disease could only be explained by the presence of mycoplasm in the seed.

Mr. V. H. Blackman and Miss Helen C. I. Fraser gave an account of the development of the æcidium of *Uromyces poae* and the life-history of *Puccinia malvacearum*, in which many new facts were brought forward, especially concerning the sexual fusion of nuclei in the æcidial cells.

Mr. E. S. Salmon described some further cultural experiments with biologic forms of the Erysiphaceæ which demonstrate the fact that the infection-powers of a "biologic form" are not altered by its residence for one generation on a strange host-plant, and give also some evidence in favour of the idea of the hereditary nature of the infection-powers of certain "biologic forms."

Mr. R. H. Biffen, in a paper on the inheritance of susceptibility to and immunity from the attacks of yellow rust, brought forward evidence to show that the liability to certain diseases is inherited, and from the results of crossing together races of wheat relatively immune from and highly susceptible to the attacks of *Puccinia glumarum*, it appears that susceptibility is dominant over immunity in the hybrid.

Miss C. M. Gibson gave an account of her infection experiments with various Uredineæ, which show that the germ tubes from the spores of any uredine may enter almost any plant, and that the attractive substance causing entry is not specialised in each species, but is something common to all plants.

Dr. A. H. Reginald Buller presented papers on the destruction of wooden paving blocks by the fungus *Lentinus lepideus*, Fr., and the reactions of the fruit-bodies of *Lentinus lepideus*, Fr., to external stimuli; and Mr. B. T. P. Barker on the structure of the ascocarp in the genus Monascus, and on some further observations on the ascocarp of Ryparobius.

Dr. A. F. Blakeslee (U.S.A.) briefly described his investigations on the sexuality of zygospore formation. According to their method of zygospore formation the Mucorineæ may be divided into homothallic and heterothallic forms. In the first group zygospores are developed from branches of the same thallus. In the second group, comprising probably a majority of the species, the zygospores are developed from branches which belong to thalli diverse in character. The sexual strains in an individual species show a more or less marked difference in vegetative luxuriance. The author concludes that the mycelium of the homothallic species is bisexual, whilst that of the heterothallic species is unisexual.

In the agricultural subsection, which met under the presidency of Prof. W. Somerville, the following papers were read:—improvement of wheats and Mendel's laws, R. H. Biffen; hybridisation of cereals, Dr. J. H. Wilson; the clover mystery: a probable solution of it, R. H. Elliott; analysis of soil by the plant, and the probable error of agricultural field experiments, A. D. Hall; determination of available phosphates, T. S. Dymond and G. Clark; sulphates in their relation to growth of crops, T. S. Dymond and F. Hughes; the improvement of clay pastures by leguminous plants, Prof. T. H. Middleton; formation of ammonia, nitrites, and nitrates, Dr. E. J. Russell; chemical composition of mangels, and variation in mangels, T. B. Wood and R. A. Berry. Prof. W. D. Atwater (Middletown, Conn., U.S.A.), who was present at the meeting, also communicated a paper to the section.

EDUCATION AT THE BRITISH ASSOCIATION.

After the president's address (published in Nature of September 15), the first paper on the programme was on the present educational position of logic and psychology, by Miss E. E. C. Jones, in which attention was directed to the fact that, on the one hand, logical and psychological studies hold a position of growing importance in English thought and education, while, on the other hand, the quality and organisation of the instruction supplied leave much to be desired. Some logic and psychology are now required for teachers' training examinations; it is also desirable that all students of religious doctrine or of the great questions of philosophy should be equipped with logical method and psychological knowledge.

The section listened with interest to the lucid account of the advances made in the teaching of experimental science in the secondary schools of Ireland given by the Right Rev. Gerald Molloy. The result of three years' work is splendid, thanks to a cordial and remarkable cooperation of teachers, of schools, and of local authorities with the Intermediate Education Board and the Department of Agriculture and Technical Instruction. These latter bodies have adopted a common programme in science subjects, and are carrying out a common system of examination and inspection. All the secondary schools of the country, about 250 in number, are enjoying the benefits due to judicious introduction of practical work in the laboratory, and the administrators may justly be congratulated on the fact that there are more than 9000 pupils following the preliminary course, and 1500 pursuing a more specialised course after passing through the preliminary. The manner in which the first great difficulty, that of providing competent teachers, was overcome is interesting, but it is of more importance now to note that the organisers took the right road to efficiency by putting men first and bricks and mortar second. (Might not some of our local authorities and governing bodies in England receive a useful hint?) For the future "the Department propose to grant the 'Irish Teacher's Science Certificate' to all students who pass through a three years' course, prescribed for the purpose, in the Royal College of Science, Dublin. They will also recognise as qualified teachers students who have followed a similar course in any university or technical college, and who have obtained the corresponding degree or diploma."

The discussion was mainly congratulatory, but one criticism deserves, and will no doubt receive, careful consideration from the authorities. It was felt by many that among subjects relegated to the optional courses were some of such fundamental importance as to be an indispensable part of an all-round education. This, of course, is part of the wide and difficult problem which is getting more and more pressing, viz. what can be safely *left out* of the secondary school curriculum? It is safe to reply to Dr.

Molloy's question, as to the advisability of limiting the preliminary science course to those who do not take the classical, by affirming that *all* boys and girls should take a science course of some kind at some period of their school life. Sir Philip Magnus insisted that science is not an "extra," but a necessary part of the curriculum (not for the whole time of all pupils). Inspection should precede examination—it is unnecessary to *examine* junior pupils. Mr. George Fletcher, speaking as an inspector, stated that other subjects of the curriculum have not suffered by the introduction of science into Irish schools. Their unparalleled progress was made possible by the voluntary sacrifice of their holidays by the teachers. Prof. Armstrong regretted that the courses of demonstrations, which had been instituted by the London School Board and had proved so valuable a help to science teachers, had been discontinued.

A paper which has attracted a widespread interest was that by Dr. J. de Körösy, director of municipal statistics at Budapest, entitled "Comparison of the Intellectual Power of the Two Sexes." The author had received reports since 1873 of 800,000 individual children. One method of testing applied was to take the percentage of children who had to repeat the year's work instead of passing on to the next standard. In the elementary schools the figures were all in favour of the girls, the two sexes being nearly level at first, but the advantage of the girls increasing with age. This result is more marked in the higher elementary or "citizen" schools (age ten to sixteen), but in this case the boys are drawn from a class less gifted than ordinary, while the opposite holds for girls.

Another test was the frequency of "very good" and "good" marks in the fourth standard. These best marks were obtained in arithmetic by 10·8 per cent. of boys and by 35·3 per cent. of girls. A truly surprising result! Several subsequent speakers admitted the superiority of girls at school and college, but contended that there it ended, but few women being eminent in learned professions, and the majority falling behind men when it came to the "struggle for existence." Dr. Beverley, of Norwich, differed from this view, arguing that women needed only equality of opportunity.

Mr. J. H. Leonard read a short paper on specialisation in science teaching in secondary schools. The contention was that the efficiency of science teaching in schools is itself threatened with a particular kind of specialism, *e.g.* objection was taken to the performance of titrations before sufficient progress has been made in elementary chemistry. The effect of according undue prominence to one study is that the school time is not fairly allotted—*e.g.* botany and physiography are often omitted—while the scholars are wearied instead of being interested. Unfortunately there was no time for discussion of Mr. Leonard's views.

Lieut.-Colonel McKinlay gave a description of his method of "realistic arithmetic." The "appeal to the eye" is thoroughly effective. The apparatus has been used in schools with favourable results.

School Certificates.

The main feature on the morning of August 19 was the discussion on school-leaving certificates. Prof. Armstrong led off by reading a "Report of the Committee on the Influence of Examinations." He explained that the question of examinations had entered upon a new phase by the issue, on July 12, by the Board of Education, Whitehall, of suggestions for a system of *school certificates* submitted by the consultative committee to the board. The committee was not in a position, therefore, to publish a report in the true sense of the word, but was presenting a compendium including the proposals of the consultative committee, notes on the Scotch leaving certificate, the London University scheme, and extracts from the Mosely Commission Report referring to the American accrediting system. Dr. Gray (Bradfield College) read a paper, communicated by Canon Bell, narrating the origin of the proposals of the consultative committee. Attention was directed to the vexatious multiplicity of examinations, no fewer than 64 in the United Kingdom and 140 in the Empire being accepted as qualifying for entrance into one or more professional courses.

Sir Arthur Rücker said the position was complicated by the fact that Oxford, Cambridge, and London Universities have already carried out something in the nature of school-leaving examinations. The consultative committee had left the financial question out altogether. There had been no opportunity for the universities to consider the scheme of the consultative committee, but he, personally, was in favour of its general principles. Mr. Ernest Gray, M.P., regretted that the antiquated procedure of the British Association had left those attending this section in the dark as to the subjects to be brought forward until the meeting actually commenced. He thought that the scheme would revolutionise secondary schools, by enlarging the staff and increasing the length of school-life. The difficulties connected with fees must be met from other sources. The proposal was really a dual certificate, a junior and a senior; this principle was accepted by learned societies. A most valuable feature was the active share which the teachers are to take in the examination of their school; he thought that English teachers should be prepared to take the responsibility of recommending pupils, as is done in France. Schools should direct examinations, not *vice versâ*. Local authorities will insist on some form of examination, and will probably wish to see local schools grouped round local universities.

The Rev. R. D. Swallow, on the other hand, regarded the idea of encouraging local authorities to hold to local universities as most detrimental. Secondary schools of the old-fashioned type would remain under the influence of the old universities, but a new type was springing up which the consultative committee had ignored, the higher elementary school with the words higher elementary painted out and secondary painted in. Dr. Mangold (Berlin) sympathised with systems of examination in which the teacher plays an essential part. Proved to be very satisfactory in Germany, the plan of taking into account the teacher's knowledge of the character and abilities of his pupils should act well in this country.

Principal Griffiths (Cardiff) referred to the experience of the Central Welsh Board. There was a tendency for a central board to become rigid, and he hoped that any such board would perform advisory and inspective rather than executive functions. We have to remove from local authorities their distrust of teachers. The curious worship of examination results by such authorities seemed to be a growing evil. Sir Oliver Lodge stated that Birmingham will put into action a scheme similar to that recommended by what was, on the whole, the admirable report of the consultative committee. Teachers should determine the relative order of pupils; the outside inspector should standardise and not pretend to read all the papers. He hoped universities would accept each other's certificates, and that no vested interests would stand in the way of reform.

Mr. Alderman Fordham (vice-chairman Cambs. County Council) thought that the alleged distrust of teachers did not, in reality, exist. It was recognised that the highest respect must be paid to teachers of every grade as the vital bases of every part of their work. He was in favour of the Swiss system of public examination for all children, and was dissatisfied with the existing mode of testing elementary schools. Miss Cooper wanted varieties of examination, equatable by their known equivalents. Mr. Oscar Browning thought that parents were insufficiently considered; a parent has a right to know whether his child has been taught to a reasonable standard. Mr. Mollison (Clare College) pointed out that America had a great advantage in freedom from examinations, and urged that the establishment of a fresh State board would be a disaster. Dr. Gray, as a member of the Mosely Commission, feared that the absence of a national desire for education made it necessary for us to have something more than the accrediting system. Dr. Roberts, Messrs. Flather, Fitzpatrick, and Cloudesley Brereton also spoke. The chairman, summing up, expressed his conviction that we had little need to fear State control, as we have inherited so long a struggle for freedom that we are hardly likely to be tyrannised over. The consultative committee had looked the finance difficulty in the face—*and passed on.*

National and Local Provision for the Training of Teachers.

The discussion on this urgent problem opened on Monday, August 22, with a paper contributed by the Right Hon. Henry Hobhouse, M.P., the object of which was "to indicate the difficulties which beset local bodies in their endeavours to perform what is really a national task."

By the recent regulations training is insisted upon as a condition for registration, but the actual establishment of training colleges has been left, *more suo,* to private initiative. Under the Act of 1902, the burden of supplying the deficiency is thrown, not upon the State, but upon local authorities. In addition to the difficulty which the smaller bodies would experience in raising funds for new institutions with expensive buildings and equipment, there is the further one of getting proper cooperation between so many authorities, autonomous and often jealous of each other. The most serious drawback of all lies in the "localisation" of the individual teacher. Certain local authorities may prefer to secure teachers trained elsewhere by the offer of high salaries rather than train them themselves. As a counter-move, a local authority may bind each teacher it trains to serve for a reasonable number of years exclusively in its own schools, a system of indenture which, however sound financially, is educationally unsound, and which will seriously prejudice free circulation of educational energy, with special detriment to the weaker counties and boroughs. The present problem is how to encourage and impel our local authorities each to bear its fair share in the task of increasing the supply of competent teachers without forcing them all into one groove, and depriving them of all initiative and independence.

Mr. H. Macan sent a paper which arrived too late for an abstract to be made thereof, and was too lengthy to read in full. In the circumstances justice could not be done to this contribution. *Inter alia* he pointed out that a central hall costing 30*l.* per place was worthless compared with good teachers. As a large number of teachers at present leave the profession at an early age, he suggested that there should be two classes of teachers, one highly trained, the others less qualified short-service persons sufficiently equipped for the journeyman-work of teaching. (The writer of these notes does not know what "journeyman-work" means as applied to teaching.)

Mr. Gray, M.P., said it was impossible to escape from the conclusion that the training of teachers should be a national charge. Secondary-school teachers needed better training in the art and craft of their profession, and the barrier between elementary and secondary should be removed. Mr. G. F. Daniell considered that the supply of men for secondary schools would be met if the kind of training required was made known, and proper pay, position, and conditions of work and tenure provided.

The Rev. W. T. A. Barber said that elementary teachers should have some practice in secondary schools during their training. The training college should be in connection with some university. To add a year's training in pedagogics to the costly years spent in graduating at a university would stop the supply of teachers for secondary schools unless the chances of the profession were improved. Dr. Ernest Cook, chairman of the Bristol Education Committee, complained that the ordinary training college provided secondary education, but very little instruction in the art of teaching.

Principal Griffiths referred to the position in Wales, where there is to be a congress of representatives of education committees, of the university, of teachers' associations, and of politicians to consider the position in the Principality. At present they needed to import 280 teachers from the neighbouring kingdom of England. He feared the effect of enlarging day training colleges, and wished to remove distinctions between "normal" and ordinary university students. Sir John Gorst said the difficulty of supplying teachers had increased since the 1902 Act was passed, and pressed for energetic measures to be taken both by Government and the local authorities. "Supply and demand" would not suffice except for the great public schools. The pupil-teacher system was rather a failure, and the training college system not a success. The burden laid on the young pupil teacher was greater than anyone could bear. The qualifications of teachers should be certified by the university, which should supply pedagogics, no new expensive buildings being required, and the attempt to distinguish between elementary, secondary, and technical education should be abandoned. Assistance for training should be given from both Government and local funds. He thought the value of Ireland as a recruiting ground should receive attention.

Mr. J. L. Holland pointed out that we needed to know the actual number of teachers required, and stated the average life as a teacher to be, for a man, a little under 14·3 years, for a woman about 7 years. This means a fresh teacher per annum for every 2000 to 2500 of the population, and it should be noted that for every boy there are five girls going to be teachers. (The number of pupils in secondary schools in 1900 was:—boys a fraction over, girls a fraction under, five per thousand of the population.) The scholarship ladder is in danger of becoming a treadmill, leading from the school as a pupil to the same school as a teacher, through the bad influence of "localisation." Miss Walter said that the short professional life of teachers was due to low pay, and urged that more money be spent on salaries, in which case less would need to be spent on training.

M. Émile Havelaque, Inspector-General of Public Instruction in France, made a particularly interesting speech, in the course of which he dwelt on the advantage that would accrue if a larger number of English students for the higher branches of the profession could be induced to take up residence at French schools and colleges, under a newly instituted scheme. The student would be able to study French educational methods; the teaching of the mother tongue, for instance, has received particular attention in France, while it is surprisingly neglected in England.

Dr. Mangold observed that in Germany the training of teachers was a national charge, the masters of method receiving a small addition to their salaries as teachers. He was astonished that it should be desired to remove the differentiation between elementary and secondary—such removal would be impossible in Germany at present.

Manual Training.

Sir Philip Magnus opened the discussion on methods of imparting manual instruction in its broadest sense in the various types of schools. Other speakers included Mr. George Fletcher, Mr. Millett, Mr. Oscar Browning, Mrs. Marvin, Prof. Armstrong, Miss Cooper, and Miss Taylor. There was agreement as to the value of manual training as a part of general education for all boys and girls, and it was also felt by the opener and others that the instruction should have the same aim for the two sexes. On the other hand, the subjects used for this purpose should be different, the manual teaching of girls being associated closely with the domestic arts.

Reports of Committees.

Mr. Hugh Richardson presented an interim report of the committee on the courses of practical, experimental, and observational studies most suitable for elementary schools. Useful work is being done, and it is satisfactory to note that a grant has been made for its continuance.

The report of the committee on the conditions of health essential to the carrying on of the work of instruction in schools emphasised the need of teachers themselves being trained to understand how the laws of health entered into every department of school life. Suggestions were made for the curriculum for such training. The report was followed by a discussion on hungry and exhausted children, led by Sir John Gorst, who boldly advocated that local authorities should be empowered to feed half-starved children and to punish those responsible for their neglect.

Afternoon Lectures.

On August 19 Mr. A. D. Hall lectured on the need of scientific method in elementary rural instruction, and on August 22 Prof. Armstrong gave a short address on the research method applied to experimental teaching.

The founders of the section should be well satisfied with the position which it has taken in so short a time. The gathering at Cambridge was remarkable for the bringing together of workers in every branch of the diverse paths of education. The debates were thoroughly well sustained, and with better arrangements for continuing the work of committees between the annual meetings, and some improvement of machinery for advertising the subjects to be discussed beforehand, there can be no doubt that Section L will exercise a useful national influence.

G. F. D.